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# **GLOBAL INFORMATION TECHNOLOGY INFRASTRUCTURE FOR A GLOBAL NON-PROFIT ORGANISATION**

A thesis presented in partial fulfilment of  
the requirements for the degree of  
Master of Technology at  
Massey University

Richard M. van Laar-Veth  
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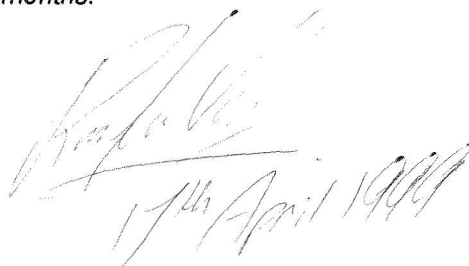
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# Abstract

With the recent worldwide growth of the Internet, computers are becoming interconnected in a global communications network. Most people view the Internet as a universal communications medium that can replace telephone, television, and radio.

Historically, for organisations and enterprises that could afford to do so, expensive telecommunication lines and Wide Area Network technologies were used for global communications, which allowed computers to communicate using proprietary protocols.

For non-profit organisations in particular, the Internet has made it possible to connect offices and individuals, using open standard protocols, at a fraction of the cost of other alternatives.

This study focuses on the investigation and development of a global communication system and information technology (IT) infrastructure that uses the Internet as its communication platform for a particular non-profit organisation, OMF International.

Without a clear understanding of the limitations of the technologies involved, the development of an IT project is likely to be flawed or fail. (Standish Group, 1995)

The findings from this investigation revealed that a global communication system and IT infrastructure, suitable for OMF International, needed to overcome limitations in the use and access of the Internet, the unreliability of different email systems to deliver email messages, and financial and human resource constraints.

The study found that methods used in 'for-profit' organisations for the development of an IT infrastructure, were applicable to this non-profit organisation, resulting in the successful implementation of a global communication system and IT infrastructure.

The choice of IT solutions and technologies within OMF was often based on functionality rather than feasibility, and its global IT infrastructure requirements were overlooked. The study found that by comparison Lotus Notes' client/server IT infrastructure requirements were considerably less than that of Microsoft Exchange client/server, however, alternative low-cost open standard messaging options were more affordable. Conclusively, open standard IT solutions for global communications are better suited than for this non-profit organisation, than proprietary solutions.

The study also highlighted the need for an IT architecture, that would provide a plan and strategic context for future IT development within OMF International, which would overcome problems with concurrent IT projects using different technologies.

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*“I can do everything through [God] who gives me strength.”*

*(Philippians 4:13)*

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# Chapter 1

## Introduction

In the past few decades, computers have begun to play an increasingly larger role in education, business, and entertainment, and in the way that we communicate with other people. Nicolas Negroponte's (1995) statement, "computing is not about computers....it is about living" is becoming more of a reality everyday.

With the recent worldwide growth of the Internet, computers are becoming interconnected in a global communications network. Most people view the Internet as a universal communications medium that can replace telephone, television, and radio. Governments that promote technology such as United States of America (USA), Japan and Singapore are building national communication infrastructures to make this possible.

The term "Internet" derives from "internetwork" and refers to a worldwide collection of computers and networks that have agreed to interconnect and communicate using a common, non-proprietary protocol suite called TCP/IP<sup>1</sup>. This means computers with different hardware and software can communicate with each other.

Many organisations using computer technology that have historically been entrenched in proprietary software and hardware solutions for information technology needs are moving towards open and non-proprietary standards. For example, both Microsoft and Apple

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<sup>1</sup> TCP/IP, Transmission Control Protocol / Internet Protocol.



developed computer systems using software, hardware and communication protocols specific to its own environments. More recently, these two companies are developing computer systems using open standards.

Similarly, the software and hardware vendors are being forced to comply with open standards to remain competitive, and much is being said about "Open", "Internet-ready" and "Web-centric" products and computer solutions in advertisements and reviews.

For non-profit organisations in particular, i.e. organisations whose strategy is not driven by profit or revenue making, the Internet has made it possible to connect remote offices and individuals at a fraction of the cost of other alternatives such as direct telephone.

Although there seems to be a common trend to move to open standards and Internet technologies, there are significant differences between the way in which larger 'for-profit' and 'non-profits' International organisations deal with issues surrounding the use of the Internet.

Most other research on global computer communications and IT infrastructures are written for larger Multinational or International corporates and organisations. (Bradley, 1993, Chen, 1995, Hawryszkiewicz, 1997, Higginbottom, 1998, Keen, 1996, Luftman, 1996, OTG, 1998) This study focuses on the needs of a particular non-profit international organisation, OMF International. OMF, as an organisation has recognised that it needs to improve its effectiveness in achieving its goals, and communication is an important part in the effectiveness of an organisation.

## 1.1 OMF International, a Non-profit Global Organisation

OMF International is an organisation, which is not profit or revenue generating.

OMF International is a Christian Mission Organisation, founded in 1865 as the China Inland Mission (CIM) by James Hudson Taylor, with its focus on China's inland provinces. In the two years after the Communists took power in 1949, the CIM had to leave China. At that stage, it became the Overseas Missionary Fellowship, and moved its headquarters to Singapore, from which base its missionaries are sent to many countries in East Asia. In 1993, it adopted its current name of OMF International (OMF).

As well as sharing the Christian message with peoples of East Asia, and establishing churches where there is a need, OMF also addresses certain areas of academic, social and medical work.

### *What is an OMFer?*

Although OMF has various categories of membership consisting of employed staff and of organisations and individuals holding informal relationships with OMF, essentially there are only two major categories of people: "OMFers", and the Public.

OMFers who work in an OMF office have different needs from those working away from an office environment. In this investigation therefore, the following two categories are used: OMF - Remote, and OMF - Office.

## 1.2 OMF International as a Global Organisation

OMF Membership is open to Christians of every nation and race. Currently there are about 1,000 OMF members drawn from many churches and denominations from twenty-one countries, working in mainly in East Asian countries, and amongst Asian diaspora.

The following can be said about the geographical distribution of OMFers and OMF Offices

### ***OMF - Office***

OMF has thirty-five offices in twenty countries. Although most offices are located in East Asia, every continent has one or more OMF Office.

### ***OMF - Remote***

Similarly, most people working within OMF work in East Asia. The make-up of OMF members comes from twenty-one nationalities.

## **1.3 Importance of Communication within OMF**

Multi-cultural, multi-national and multi-generational lines of communication exist within OMF, and between OMF and the public. Missionaries may communicate with hundreds of people in their country of work<sup>2</sup> (field) and in other fields, as well as in their sending (home) country. One could imagine the links of communication with people as a complex web.

Good communication is therefore important in enabling OMF to work effectively with so many different people, churches and organisations around the world.

Hudson Taylor, founder of China Inland Mission (as OMF International was formerly known) understood the importance of communication when he wrote: *"Communication is the lifeblood of the Fellowship, second only to prayer"*. The importance of communication is no different today from a century ago when he wrote these words.

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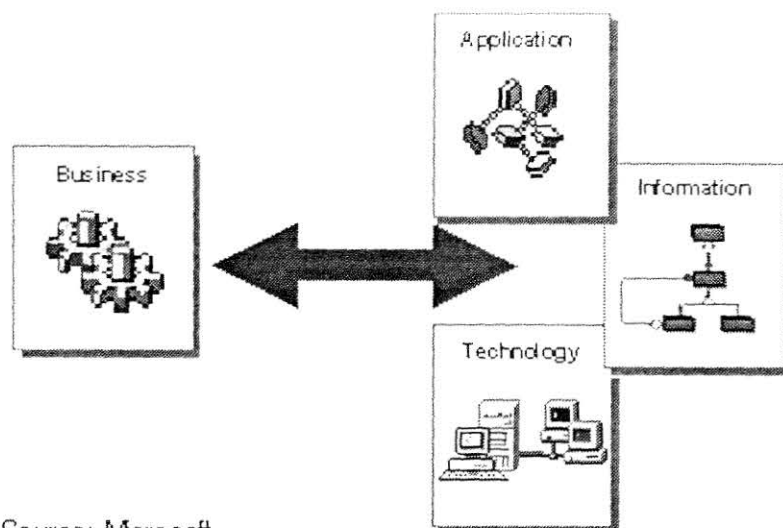
<sup>2</sup> For more information on country and area notation used within OMF refer to Appendix E.

## 1.4 Information Technology Architecture in OMF

Although no one has defined an information technology (IT) architecture (i.e. a definition about an information system and IT infrastructure) for OMF International, there is substantive information from previous work and observations to describe components of OMF's IT Architecture.

Defining OMF's IT architecture, and consequentially its needs for a Global IT infrastructure, is as much about planning and strategy as it is about information technology itself.

According to Microsoft (1, 1998), Enterprise Architecture is a framework composed of four architecture perspectives: business, application, information, and technology:



Source: Microsoft

**Figure 1: Four Architecture Perspectives**



### ***Four Perspectives, One Architecture***

Although there are four perspectives, there is only one architecture. The value of the enterprise architecture is not in any one individual perspective but in the relationships, interactions, and dependencies among perspectives.

The development of four architecture perspectives, and the examination of their individual and collective interactions, reveal the information that the organisation requires to make rational decisions about its IT priorities, projects, policies, standards, and guidelines. This information is critical for IT implementation and purchasing decisions, and provides a powerful communication tool between the IT and business units of the organisation. (Microsoft (1), 1998)

### ***Business***

The business perspective describes how the business works. It includes:

- The enterprise's high-level goals and objectives.
- The enterprise's products and services.
- The functions and the cross-functional activities the organisation performs, embodied in business processes.
- Major organisational structures.
- The interaction of all these elements.

The business perspective includes broad business strategies along with plans for moving the organisation from its current state to its future state.

OMF International strategy documents include: Purpose and Principles (OMF, Nov 1998), OMF Internal Communications Review (ICR) (Beauchamp, April 1996), The Way Forward for Computers (Ellis, October 1995).

### ***Application***

The application perspective defines the enterprise application portfolio. It includes:

- Descriptions of the automated services that support the business processes presented in the business architecture.
- Descriptions of the interaction and interdependencies (interfaces) of the organisation's application systems.
- Priorities for developing new applications and revising old applications based directly on the business architecture.

The application perspective represents the services, information, and functionality that cross organisational boundaries, linking users of different skills and functions to achieve common business objectives.

OMF International Finance System (IFS) is one example of such an application that crosses organisational boundaries. Other OMF applications include OASIS donation accounting system, Candidate Processing System, and a Personnel Database System (PDS).

### ***Information***

The information perspective describes what the organisation needs to know in order to run its business processes and operations. This includes:

- Standard data models.
- Data management policies.
- Descriptions of the patterns of information consumption and production in the organisation.

The information perspective also describes how data is bound into the workflow, including both structured data stores such as databases, and unstructured data stores such as documents, spreadsheets, and presentations that exist throughout the organisation.

OMF is traditional in its approach to data storage and archiving. Apart from data that is stored in the Personnel Database System (PDS) and various stand-alone directory or address-book systems,

most of OMF's critical information is printed and stored in filing cabinets.

### ***Technology***

The technology perspective lays out the hardware and software supporting the organisation. It includes:

- Desktop and server hardware.
- Operating systems.
- Network connectivity components.
- Printers.
- Modems.
- Other necessary peripheral devices.

The technology perspective provides a logical, vendor-independent description of infrastructure and of system components that is necessary to support the application and information perspectives. It defines the set of technology standards and services needed to execute the business mission. These standards and services include, but are not limited to:

- Topologies.
- Development environments.
- Security.
- Network services.
- Technical specifications.
- Database management system (DBMS) services.
- Application Programming Interfaces (APIs).

OMF does not have a concise description of OMF's Technology architecture. Guy Beauchamp (April 1996), discusses the need for an IT Infrastructure project that "will provide the technological capacity to communicate and share information.... that will provide a foundation for all of the Internal Communications System's information management needs".

An OMF document, "The Way Forward for Computers for OMF" written by Mark Ellis (October 1995), provided guidelines and standards for offices computers and networks, and recommendations for establishing global IT support and training. This document has recently been updated, as a result of the investigation of this study and discussions on IT within OMF. (OMF, Sept 1998)

## 1.5 OMF's Needs for a Communication System

In the history of CIM and OMF, it has had to adapt to political and economic changes in East Asia. David Pickard (1996), General Director for OMF asks, "What is the major reason for the change... we are embarked upon? - The compelling reason is the necessity of ensuring our mission's effectiveness in the 21<sup>st</sup> Century".

OMF International recognised that it needed to improve its communication, and initiated a review of its internal communication.

Beauchamp (April 1996) researched and analysed business communication for a period of two years and writes in his summary statement: "Communication within OMF is effective along traditional lines. OMF has established a communication system that meets many of the organisation's needs. However, the system is geared towards traditional organisational structures — structures that are now changing within OMF". He recommended that "OMF should continue to work towards improving its internal communications by developing a new system to deal with all aspects of communication in a changing organisational structure.

Acceptance of the proposal provided the motivation and general direction for the development of a communication system consisting of several IT projects based on a communications infrastructure or global IT infrastructure.



Beauchamp (April 1996) describes the Communications Infrastructure "that deals with the human aspect of the system, and an information technology (IT) infrastructure that provides a technological foundation for all of the Internal Communications System's information management needs." An earlier description for OMF's IT infrastructure was described as "a global Wide Area Network (WAN) to facilitate e-mail, conferencing, workflow and groupware between 35 offices in 20 countries". (OMF, Dec 1995)

An investigation was therefore needed to determine suitable methods and technologies for the implementation of a communications infrastructure or global IT Infrastructure that would become the foundation for other IT projects within OMF.

Such methods for the development of information technology architecture are well researched and documented, and are used in 'for-profit' organisations. (Luftman, 1996, The Open Group, 1998, Microsoft 1998) These references however, do not specifically say that they are applicable to 'non-profit' organisations.

The aim of this investigation therefore, is to apply previously researched and documented methods and technologies for the development of a global communications infrastructure to a specific non-profit organisation. The study seeks to support a theoretical model for a global information technology infrastructure. One notable difference between this study and one of a similar nature, applicable in an enterprise or for-profit organisation, is that the study is conducted and implemented within the financial and human resource constraints of a non-profit organisation.

Since many people within the OMF network of people, and those associated with OMF, have access to computers and the Internet, it seems reasonable to use the Internet as a communication platform. A global communications infrastructure in OMF therefore, could provide an effective way for people to communicate, thereby enabling the organisation to be effective. The premise is that OMF will in fact

be provided with a reliable, dependable and available global IT infrastructure that enables its users to communicate effectively.

### ***Measurable Effectiveness of Communication in OMF***

In seeking to address an organisation's communication needs, an appropriate global communications infrastructure and information technology infrastructure is required to provide an effective communications system that will enable people within the organisation to be able communicate.

One could surmise that improving the quality and reliability of communication mechanisms would therefore improve OMF communication. However, improving technology does not necessarily improve the effectiveness of an organisation. As Beauchamp (1996) points out "The new communications system will not solve all of OMF's problems, but it will make a significant impact on the Fellowship's ability to achieve its mission and maintain its values". The focus of this study, therefore, does not deal with human efficiencies (or inefficiencies) but rather with the effectiveness of a global communications infrastructure.

The outcome of this study will give the reader a better understanding of the issues in using the Internet as a Global Communications Infrastructure and will show how a non-profit can deal with these issues.

To OMF International, the benefits of a reliable and dependable global communication infrastructure are immediate: its members will be able to communicate effectively within the organisation.

Other non-profit organisations and small to medium enterprises (SME) that have similar communication needs and financial restraints would also benefit from this study.